

WHAT IS CLAIMED IS:

1. A process for hydroprocessing a hydrocarbon feedstock, comprising the steps of:
 - providing a hydrocarbon feed having an initial characteristic;
 - providing a first hydrogen-containing gas;
 - feeding said hydrocarbon feed and said first hydrogen-containing gas cocurrently to a first hydroprocessing zone so as to provide a first hydrocarbon product;
 - providing a plurality of additional hydroprocessing zones including a final zone and an upstream zone;
 - feeding said first hydrocarbon product cocurrently with a recycled gas to said upstream zone so as to provide an intermediate hydrocarbon product; and
 - feeding said intermediate hydrocarbon product cocurrently with a second hydrogen-containing gas to said final zone so as to provide a final hydrocarbon product having a final characteristic which is improved as compared to said initial characteristic.
2. The process according to claim 1, wherein said initial characteristic is an initial sulfur content and said final characteristic is a final sulfur content which is less than said initial sulfur content.
3. The process according to claim 2, wherein said final sulfur content is less than or equal to about 10 wppm based upon weight of said final product.
4. The process according to claim 1, wherein said first hydroprocessing zone is a first hydrodesulfurization zone.
5. The process according to claim 4, wherein said additional hydroprocessing zones comprise additional hydrodesulfurization zones.

6. The process according to claim 5, wherein said first hydrodesulfurization zone and said upstream hydrodesulfurization zone each produce a gas phase containing hydrogen sulfide hydrogen and volatile hydrocarbon fractions and further comprising feeding said gas phase to a low temperature separator for separating a liquid phase containing said volatile hydrocarbon fractions and a gas phase containing said hydrogen sulfide and hydrogen, and combining said volatile hydrocarbon fractions with said hydrocarbon feed.

7. The process according to claim 1, wherein said final zone also produces a hydrogen-containing gas phase, and further comprising feeding said hydrogen-containing gas phase to said upstream zone as said recycled gas.

8. The process according to claim 1, wherein said first hydrogen-containing gas and said second hydrogen-containing gas are separate quantities of fresh hydrogen-containing gas, and wherein said recycled gas contains contaminant removed from said intermediate hydrocarbon product.

9. The process according to claim 1, wherein each of said first hydroprocessing zone and said plurality of additional zones contains a hydroprocessing catalyst.

10. The process according to claim 1, wherein said hydrocarbon feed is a Diesel feed.

11. The process according to claim 1, wherein said hydrocarbon feed is a gasoil feed.

12. The process according to claim 1, wherein said hydrocarbon feed is a naphtha feed, and further comprising feeding a product of said first hydroprocessing zone and said plurality of additional hydroprocessing zones to a condenser for providing liquid phase naphtha and gas phase hydrogen and hydrogen sulfide.

13. A system for hydroprocessing a hydrocarbon feed, comprising:

a first hydroprocessing zone containing a hydroprocessing catalyst and having an inlet for cocurrently receiving a hydrocarbon feed and a first hydrogen-containing gas phase;

a plurality of additional hydroprocessing zones each containing a hydroprocessing catalyst and including a final zone and an upstream zone, said upstream zone having an inlet for cocurrently receiving a hydrocarbon product from said first hydroprocessing zone and a recycled hydrogen-containing gas phase, said final zone having an inlet for cocurrently receiving a hydrocarbon product from said upstream hydroprocessing zone cocurrently with a second hydrogen-containing gas phase; and

a separator for receiving a product from said final hydroprocessing zone and for separating said product into a hydrocarbon phase and said recycled hydrogen-containing gas phase.

14. The system of claim 13, wherein said first hydroprocessing zone is a hydrodesulfurization zone containing a hydrodesulfurization catalyst.

15. The system of claim 13, wherein said additional hydroprocessing zones comprise at least one additional hydrodesulfurization zone containing a hydrodesulfurization catalyst.

16. The system of claim 13, wherein each of said first hydroprocessing zone and said additional hydroprocessing zones is a hydrodesulfurization zone containing a hydrodesulfurization catalyst.